

## WETLAND LOSS IN ASPEN PARKLAND OF SASKATCHEWAN

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Wetlands are some of the most productive ecosystems, providing a multitude of benefits including ground water recharge, soil and water conservation, flood prevention and wildlife habitat. Most of these benefits accrue to society at large. Wetlands can also be obstacles to farming and development, and may represent lost economic opportunity. Most of these costs are borne by the landowner. Wetlands in Saskatchewan have been and continue to be destroyed. Although some land use changes on wetlands have been documented and reviewed across Canada,<sup>7</sup> estimates of actual loss of wetlands has not been intensively studied in Saskatchewan. This study attempts to estimate the percentage of wetlands permanently lost in Saskatchewan from the late 1940s to the present, and compares these results to other studies.

**Methods** Quarter sections were randomly selected from five regions of the province which fall within key program areas for the North American Waterfowl Management Plan (NAWMP)<sup>16</sup> in Saskatchewan (Table 1). Historical air photos were obtained from Central Survey and Mapping Agency at a scale of 1:15,000. The oldest available photos were used, the majority of which (75-80%) were from 1947 and 1949. Recent aerial photographs (1986-1992) at a scale of 1:20,000 were obtained from Ducks Unlimited Canada for com-

parison. Photos were enlarged 200% on a laser photocopier, which preserved the clarity and definition of the original photo, to enhance detection of wetlands.

Wetlands were delineated as any depression or basin which was covered by water, at least periodically. Numbers of wetlands were counted independently on both the old and new photos and compared side by side to assist in discriminating wetlands and determining loss. Loss was defined as total obliteration (ie. drained and filled). Total number of wetlands and average per quarter section were determined for each region. Percentage loss of wetlands is reported for each region and overall. A comparison with ground-truthed transects conducted under the Prairie Pothole Project in the Redvers area was made to calibrate the accuracy of this study in identifying wetlands from photos.

**Results** A total of 2,469 wetlands were counted on the old photos for an average of 29.4/quarter section. On the recent photography 2,314 wetlands were counted for an average of 27.5/quarter section. This represents an average 6% loss of wetlands in all regions. The region with the highest loss was the Thickwood Hills (29%), while at Redvers there was a 6% increase; the other three regions experienced losses of 7-16% (Table 1).

**Table 1. COMPARISON OF NUMBER OF WETLANDS ON OLD AND NEW AIR PHOTOS IN SASKATCHEWAN**

Region	No. of Quarter Sections Examined	Number of Wetlands		Percent Loss/Gain
		Old Photos	New Photos	
Redvers	20	807	854	+6
Wadena	23	605	561	-7
Saskatoon	18	530	493	-7
Thickwood	12	286	203	-29
Melfort	11	241	203	-16
TOTAL	84	2,469	2,314	-6

The recently ground-truthed transects at Redvers revealed a total of 223 wetlands, compared to 205 identified from the photos; a 92% level of accuracy in discriminating wetlands via air photo interpretation. Most of the wetlands which were missed on the air photos were small temporary basins and roadside wetlands.

We recognize that factors such as differences in wetland conditions between the time when the old and new photographs were taken as well as time of year when the photos were taken can affect results of such a study. In addition, our ability to detect small temporary ponds from aerial photographs could also lead to errors in estimating wetland numbers. However, the comparison with ground-truthed transects from the Redvers area indicates that the number of these wetlands which were missed by interpreting air photos is not high, particularly considering that the Redvers area has a very high density of small wetlands.<sup>1</sup> Overriding these factors however is how wetland loss is defined. Defining cultivation of a wetland as loss would result in much higher estimates of wetland loss than did our examination of air photos for "permanent" loss. We believe that this study provides reasonably accurate information on rates of complete, long-term wetland loss caused by drainage or filling.

**Discussion** Our results show that

permanent wetland loss since the 1940s in Saskatchewan averages 6% with substantial variation among regions. The variation in loss rates among regions, from +6% at Redvers to -29% in the Thickwood Hills (Table 1), demonstrates how results can be affected by factors such as annual variation in wetland conditions (e.g. the wet spring in Redvers in 1986 when the photos were taken) or a high rate of land alteration such as the extensive bush clearing, drainage and filling which was evident in the Thickwood Hills area. The northernmost two areas exhibit the highest loss rates in this study (Thickwood and Melfort). This may be a result of relatively recent change (i.e. post-1940s) compared to more southerly areas (i.e. pre-1940s).

An estimate of 40% wetland loss on the Canadian prairies is often cited,<sup>9</sup> considerably higher than that revealed by this study and several others (Table 2). Only two of the studies we reviewed reported a loss rate of 40% or higher. It is noteworthy that both of those studies looked at the area of wetlands lost, not the number of wetlands lost. In the aspen parkland of Alberta, drainage on a relatively small 109-ha area from the turn of the century was estimated at 61% of the original wetland area with 81% of this having been drained by 1950.<sup>13</sup> In the Minnedosa pothole region of southwestern Manitoba, a



**Table 2. COMPARATIVE STUDIES OF LAND USE CHANGE AND WETLAND LOSS IN THE PRAIRIE PROVINCES**

Study Area	Period	Wetland Lost		Comments
		Area (%)	Number (%)	
Alberta Aspen Parkland	1900-1970 <sup>13</sup>	61	—	survey plans, drainage maps, air photos and field and air surveys, 109 ha area, 81% drained by 1950, wetlands less than 0.8 ha not included
Minnedosa Pothole Region, Manitoba	1928-1964 <sup>6</sup>	27	—	12 roadside transects, air photos and field survey, 3 land use classes
	1964-1974 <sup>10</sup>	41	—	updates of Kiel <i>et al.</i> <sup>6</sup>
	1974-1982 <sup>11</sup>	33	—	
	1928-1982	70	—	overall loss <sup>6,10,11</sup>
Black Soil Zone of the Prairie Provinces	1940-1970 <sup>3</sup>	13	4.5	600 quarter sections, air photos and field reconnaissance, individual pond records
Minnedosa Pothole Region, Manitoba	1948-1970 <sup>12</sup>	-4	—	air photos and field investigations, 5 cover classes, 23 km <sup>2</sup>
Newdale Plain, Manitoba	1964-1974 <sup>2</sup>	area and perimeter increased	7	20 sample plots at 65 ha each, air photos, 7 cover classes, wetland loss offset by gain in temporary ponds
NAWMP Key Program Areas in Saskatchewan (this study)	1947-1992	—	6	84 quarter sections, air photos

41% loss of wetland area was reported between 1964 and 1974 based on the roadside transects of Kiel *et al.*<sup>6,10</sup> An update on that same area revealed a 70% loss of wetland area from 1928-1982.<sup>11</sup> Roadside transects may be biased towards high wetland loss because such wetlands may be destroyed by road-building activity and drainage may be aided by the proximity of roadside ditches.<sup>9</sup>

Within smaller areas of the Minnedosa pothole region, where high losses of wetland area have been reported, the findings of other studies show conflicting results to those studies which were based on roadside surveys. In a study of nine sections south of the town of Minnedosa, water area increased from 4% to 8% between 1948 and 1970.<sup>12</sup> Another study of the same area found no appreciable change in wetland numbers between 1964-1974 but did detect an increase in both wetland

area and perimeter.<sup>2</sup> A study of the black soil zone of the prairie provinces (which included our study area) found a 13% loss of wetland area and a 4.5% loss of wetland numbers between 1940 and 1970.<sup>3</sup> Thus it appears that studies of loss of wetland area show much more variability and often higher loss rates than do studies which look at loss of wetland numbers.

Comparisons of wetland loss among different studies may be complicated by site-specific differences (ie. an area could have a topography which is particularly conducive to drainage or may have experienced a high drainage rate for other reasons) as well as varying methods of estimating and defining loss. Other potential sources of variation are differences in annual conditions (ie. wet versus dry years) and time of year that wetland comparisons are made (ie. wetland numbers and area typically decrease from spring to fall).





Strawberry Lakes

Lorne Scott

The permanent loss of wetland basins or depressions in Saskatchewan parkland resulting from drainage or complete filling between the 1940s and early 1990s would appear to be in the order of 10% although it may be considerably higher in more northerly regions. Turner *et al.*<sup>15</sup> reported a 0.19% annual rate of drainage in Saskatchewan which translates to a 7% loss rate over a 40-year span, similar to our study. Goodman and Pryor's<sup>3</sup> 4.5% loss over 30 years is also similar in magnitude. However, more transitory impacts on wetland basins, such as cultivation of primarily ephemeral ponds, have functionally destroyed 35-50% of Saskatchewan wetlands.<sup>1,15</sup> Eliminating wetland vegetation through cultivation results in decreased snow catchment, increased soil and water erosion, and destruction of the plant life and aquatic invertebrates which form the basis of the wetland ecosystem.<sup>5,8,14</sup>

A high degree impact on wetland margins was evident over the 40-year span examined in this study. The clearing of bush and the cultiva-

tion of dry temporary wetlands were two obvious major changes. Rapid degradation of wetland basins and margins continues. Such activity eliminates native vegetation and hence wildlife habitat. The hardest hit are shallow temporary ponds which are easily cultivated but are preferred habitat for many species of ducks.<sup>4</sup>

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Maximum butterfly longevity: Cabbage Butterfly: 3 days for female/17 for male; Tiger Swallowtail, 3/12; Spring Azure, 4/2; Orange Sulphur, 14/25; Viceroy, -/17; Great Spangled Fritillary, -/22. *Paul Opler and George Krizek, Butterflies East of the Great Plains.*